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Utilizing the Internet to Supplement Classroom Instruction: An Analysis of Longitudinal Data

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This study utilized an Internet "Class Page" to evaluate interaction strategies in both traditional classroom settings and distance education settings where instruction was delivered via television and the Internet. Participants were primarily elementary school teachers who were enrolled in one of eleven graduate classes in Elementary School Curriculum taught during a four year period from 1997 - 2000. The participants completed survey instruments to ascertain: their participation on the "Class Page", their interactions with other students, and their attitudes toward the use of technology in the university setting. Data analyses indicate interesting responses spanning the four years. For example, examination of the data point to increased classroom teacher familiarity with computer usage over a four year time span, increased familiarity with the Internet, and higher skill levels of instructional technology applications in the classroom setting. Also, a higher degree of personal satisfaction in using classroom technology was consistent among the students. However participant perceptions in distance education settings were consistently less positive than on-site face-to-face class perceptions regarding the value of the interactive instructional technologies utilized during this time.

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The essence of teaching and learning is communication between the student and the teacher and between and among students. Students often assume a passive role in this social communication process as the recipients of information actively delivered by the instructor. The traditional educational model of teacher as the provider of information and student as the recipient of information has served for many years as an effective means of educating students. Only recently have technology advances made it relatively easy to incorporate collaborative exchanges between teacher and student, as well as between student and student, outside the formal classroom setting. World Wide Web (Web) based technologies have created educational opportunities that simulate traditional social learning experiences. Many of the initial technical difficulties associated with the use of these technologies have been minimized and the focus on learning has continually been enhanced.

This study utilized the World Wide Web and an asynchronous "Class Page" (a group of interrelated Web pages with intensive interaction components) to evaluate interaction strategies in a traditional educational setting. Participants were primarily elementary school teachers (N = 274) enrolled in one of several elementary school curriculum classes over a period of four years. Each participant completed a survey questionnaire concerning participation on the "Class Page". Responses from students in these classes from Spring semester 1997 through the Summer semester 2000 (11 classes) served as the data source for this study.

Purpose of Study

The purpose of the study was to determine the impact of utilizing an asynchronous Internet "Class Page" on:

(1) the exchange of ideas and interaction between students;

(2) the students utilization of Web resources to enhance learning; and

(3) the comparison between student responses with earlier responses from previous classes in investigating the changes that had occurred in the students' applications, attitudes, and perceptions of Web based instructional technologies.

Data Collection and Analysis

Data were collected through the use of survey instruments to determine participants' perceptions and actions regarding the "Class Page" environment and their interactions with other students. The researchers attempted to control

and to minimize the technology variable in the study by making the Web based Class Page fundamentally and technically consistent during the time frame of this study. Electronic Web compatible survey software, "**inQsit**", developed by the University Computing Services at Ball State University, was utilized to collect data. This resource provided a wide array of survey and questionnaire options, e.g., instruments using Likert-type scales, semantic differential formats, single word responses, short answer responses, and essay responses. The data collected from class surveys were compiled and reported in raw numbers and percentages rounded to the nearest whole number. The resulting frequency and interaction patterns were analyzed to interpret the responses attributed to this technology on the part of the students enrolled in the classes. The resulting information enabled the researchers to develop hypotheses regarding changing skills and perceptions of elementary classroom teachers regarding knowledge about, and application of, Web-based instructional technologies.

The data that were collected were categorical, not continuous; therefore inferential data analyses were not appropriate. The data analysis consisted of a comparison of means and percentages computed for the same course but taught over the four year period to different graduate students. Data have been presented in tabular form to illustrate the responses to selected questions. For each table, the semester, the number responding to the question, the mean score of the respondents, and the mean of the combined classes for the specific

year were presented. The numerical data in the tables have also been depicted in graphic figures to provide a different perspective regarding data changes.

Data were collected on a 5 point scale that was used to ascertain student judgments concerning their experiences in using instructional technology in the class. Responses ranged from (1) strongly disagree, (2) disagree, (3) undecided, (4) agree, to (5) strongly agree. Means were calculated by assigning numbers to each of the responses, e.g. strongly disagree = 1, disagree = 2, undecided = 3, agree = 4, and strongly agree = 5.

Findings

The emphasis in this research focused upon the teaching environment, technology, and the impact both asserted on student attitudes and perceptions about learning. When the data were analyzed, developmental patterns emerged. Data analysis generated interesting responses when compared to other class responses from previous semesters. The summary of the data provided support for the following generalizations:

(1) Student familiarity with computer usage increased during the time span of the study.

(2) Effective utilization of the Internet increased across the eleven classes.

(3) The elementary teachers reported increased understanding and use of instructional applications of classroom technology in their respective classrooms.

(4) Interaction and class involvement greatly increased through use of the Web based tools. This was a consistent finding during the four years of the study.

(5) Students who enrolled in the larger classes taught on television (two of eleven classes) viewed the value of the Internet as an instructional tool less favorably than those in the other classes. Television instruction was delivered in a two-way audio, one-way video format.

(6) Students in the television classes viewed the electronic class interactions as less valuable than students in the face-to-face classes.

(7) During the four years of this study continuous improvement in student perceptions regarding the overall value of the Class Page were documented.

Specific questions were asked of respondents and summarized in tables and illustrated figures to provide graphic representation of the data. This information is presented by the question asked of respondents as follows.

When asked if the technology that was utilized helped in achieving the purposes of the class, there was an increase in student perceptions from the Spring Semester of 1997 (4.0) to the Spring Semester of 1999 (4.6) in the two classes taught on television. However, the television classes had lower yearly mean ratings than the yearly mean ratings of classes where the instructor and students met face-to-face. Table One illustrates the gradual increase in class ratings over the four years. This pattern can be explained, in part, by the increased effectiveness and comfort of the instructor in utilizing the technology, and by the increased Internet exposure that students had experienced prior to

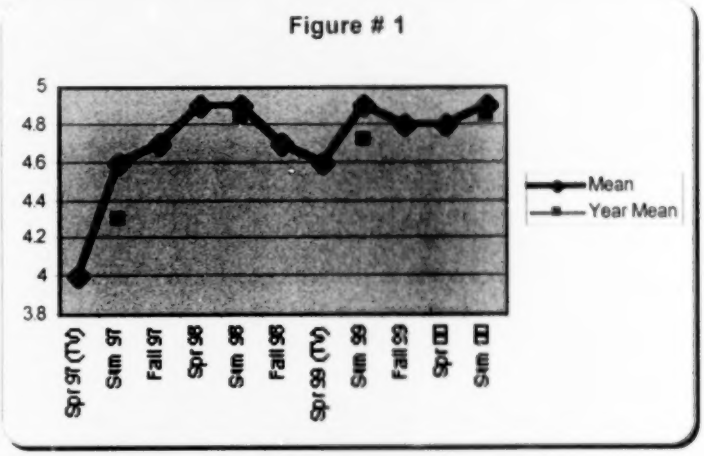
enrolling in the class. In 1997 a majority of the students enrolled in the class had no previous experience in using a class Web page; however, by 2000 most students had acquired multiple experiences using such technology either instructionally or as a part of their personal learning. In other words, the mystery

TABLE # 1

Question: "Use of this technology helped me achieve the purposes of the course"

	N	Mean	Year Mean
Spring 1997:	41(TV)	4.0	
Summer 1997:	18	4.6	4.31
Fall 1997:	19	4.7	
Spring 1998	21	4.9	
Summer 1998:	21	4.9	4.83
Fall 1998:	21	4.7	
Spring 1999:	46(TV)	4.6	
Summer 1999:	22	4.9	4.72
Fall 1999:	22	4.8	
Spring 2000:	21	4.8	
Summer 2000:	22	4.9	4.85

Figure # 1



of the technology itself was no longer the influencing factor it had been earlier.

When asked if the Class Page interaction stimulated critical thinking, similar patterns emerged from class to class. The role of critical thinking was emphasized in this class through the use of case studies and simulations specifically designed to stimulate such thinking and interaction processes. The yearly mean scores when the course was taught via distance learning were lower than when the course was taught on campus. These data are displayed in

TABLE # 2

Question: "Use of the Class Page interaction stimulated critical thinking"

	N	Mean	Year Mean
Spring 1997:	41(TV)	3.6	
Fall 1997:	19	4.5	3.89
Spring 1998	21	4.9	
Summer 1998:	21	4.9	4.77
Fall 1998:	21	4.5	
Spring 1999:	44(TV)	4.6	
Summer 1999:	22	4.7	4.68
Fall 1999:	22	4.8	
Spring 2000:	21	4.8	
Summer 2000:	22	4.9	4.85

Figure # 2

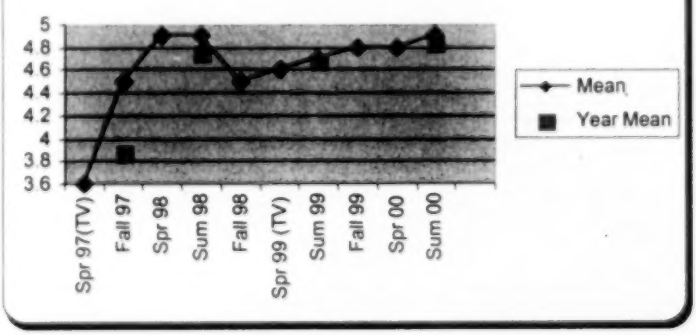


Table 2. It should be noted that data from the Summer 1997 class was not available. These data were misplaced and therefore not retrievable by the researchers.

An explanation of one of the factors in Table 2 is illustrated through the data reported by the respective classes. When students lacked technology background experiences upon enrolling in the class, their responses to the questions were generally lower. This impacted the mean scores for specific classes (see Fall 1998 data).

Student judgments regarding perceptions of the relevance of Class Page resources to the stated objectives of the course are illustrated in Table 3. The mean score of the televised course in 1999 was very similar to the other classes which differed from the initial 1997 class when the data were collected. Nevertheless, the pattern for the larger televised classes remained; the courses taught on television had lower means. The annual mean scores for these years were also lower.

When students were asked if their interactions on the Class Page were helpful in mastering course concepts and competencies, mixed results were revealed. The results are displayed in Table 4. The lowest rating was in the initial class, but subsequent classes showed a steadily increasing pattern. Again, the lower yearly mean ratings for the classes that were taught on television persisted.

TABLE # 3

Question: "Use of the Class Page resources were relevant to stated objectives of the course "

	N	Mean	Year Mean
Spring 1997:	41(TV)	4.3	
Fall 1997:	19	4.8	4.46
Spring 1998	21	4.9	
Summer 1998:	21	4.9	4.83
Fall 1998:	21	4.7	
Spring 1999:	43(TV)	4.7	
Summer 1999:	22	4.7	4.73
Fall 1999:	22	4.8	
Spring 2000:	20	4.7	
Summer 2000:	22	4.9	4.81

Figure # 3

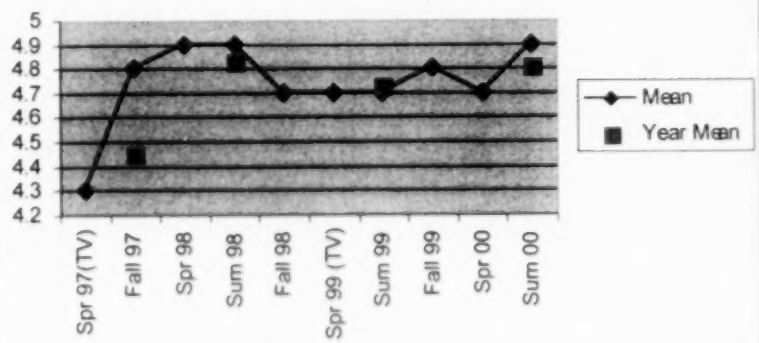
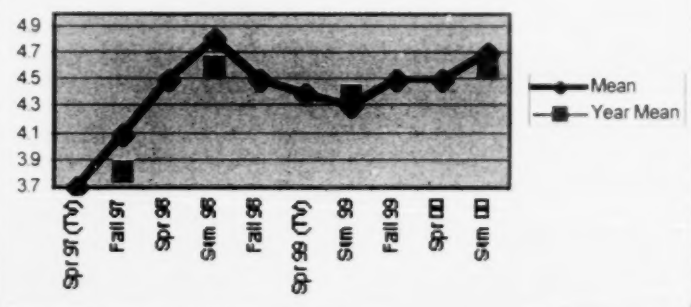


TABLE # 4

Question: "My interactions on the Class Page were very helpful in mastering course concepts and competencies"

	N	Mean	Year Mean
Spring 1997:	41(TV)	3.7	
Fall 1997:	19	4.1	3.83
Spring 1998	21	4.5	
Summer 1998:	21	4.8	4.60
Fall 1998:	21	4.5	
Spring 1999:	45(TV)	4.4	
Summer 1999:	22	4.3	4.40
Fall 1999:	22	4.5	
Spring 2000:	21	4.5	
Summer 2000:	22	4.7	4.60

Figure # 4



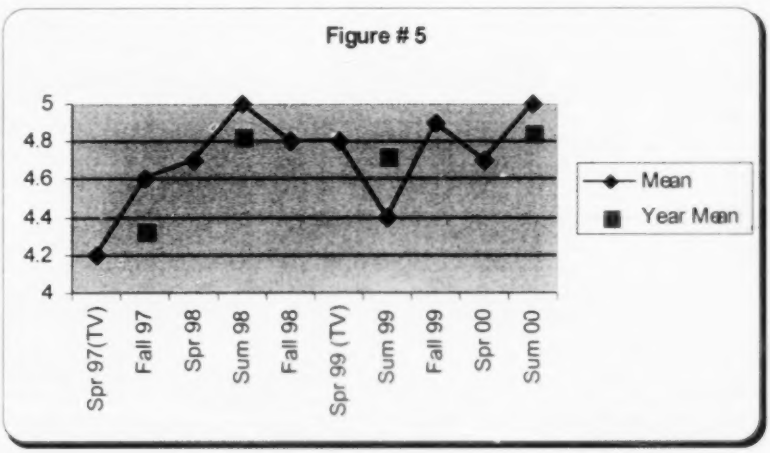
Students were asked about the sense of freedom they felt to express ideas, judgments and questions on the Class Page. Historically, this interaction has been one that students usually felt strongly about. Students have consistently expressed positive feelings regarding the value placed upon this classroom dynamic in the course experience. Data in Table 5 display a pattern,

TABLE # 5

Question: "I felt free to express my ideas, judgments, and questions on the Class Page"

	N	Mean	Year Mean
Spring 1997:	41(TV)	4.2	
Fall 1997:	19	4.6	4.33
Spring 1998	21	4.7	
Summer 1998:	21	5.0	4.83
Fall 1998:	21	4.8	
Spring 1999:	44(TV)	4.8	
Summer 1999:	22	4.4	4.73
Fall 1999:	22	4.9	
Spring 2000:	21	4.7	
Summer 2000:	22	5.0	4.85

Figure # 5



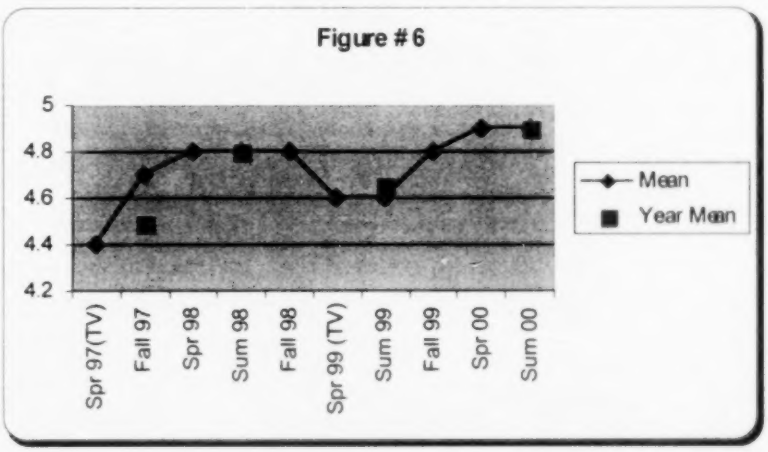
that generally increased except for the Summer 1999 class. The pattern established in the previous tables was repeated in the yearly mean scores.

TABLE # 6

Question: "The Class Page expectations in this course were appropriate to my current level of development"

	N	Mean	Year Mean
Spring 1997:	41(TV)	4.4	
Fall 1997:	19	4.7	4.49
Spring 1998	21	4.8	
Summer 1998:	21	4.8	4.80
Fall 1998:	21	4.8	
Spring 1999:	44(TV)	4.6	
Summer 1999:	22	4.6	4.65
Fall 1999:	22	4.8	
Spring 2000:	21	4.9	
Summer 2000:	22	4.9	4.90

Figure # 6



Exploring perceptions of the students' judgment regarding their current level of development as it related to Class Page expectations and usage are summarized in Table 6. The earlier patterns persisted in this response. Again, a general progression was evident since the initial class except for the yearly means when the course was taught via distance.

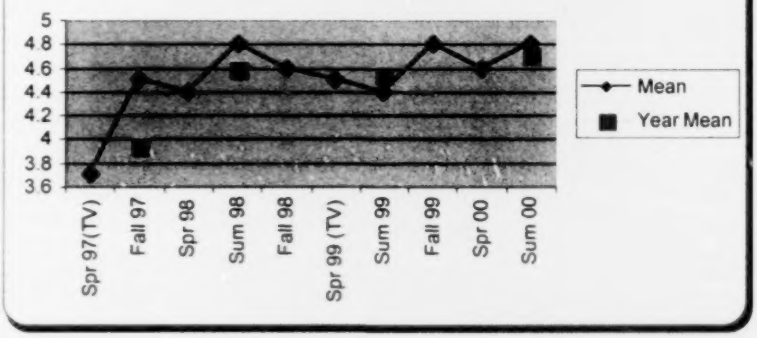
One of the basic ideas stressed in the class is the ability to apply concepts and competencies beyond the classroom. Table 7 provides a graphic display of data regarding student perceptions on this expectation. The progressive pattern of mean increase was evident again.

TABLE # 7

Question: "My Class Page participation encouraged me to apply concepts and competencies in contexts beyond the classroom"

	N	Mean	Year Mean
Spring 1997:	41(TV)	3.7	
Fall 1997:	19	4.5	3.95
Spring 1998	21	4.4	
Summer 1998:	21	4.8	4.60
Fall 1998:	21	4.6	
Spring 1999:	44(TV)	4.5	
Summer 1999:	22	4.4	4.55
Fall 1999:	22	4.8	
Spring 2000:	20	4.6	
Summer 2000:	22	4.8	4.71

Figure # 7



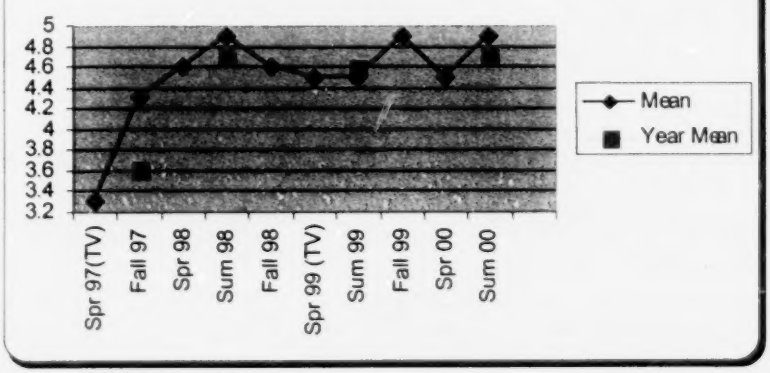
The Class Page was designed to develop a learning community for students. Table 8 illustrates an aspect of this learning community focus. Respondents were asked if their interactions with peers on the Class Page were helpful. An increase in accomplishing this focus was substantiated. The initial reason in creating a Class Page was to meet the need for establishing a learning

TABLE # 8

Question: "Interaction with my peers on the Class Page was very helpful"

	N	Mean	Year Mean
Spring 1997:	41(TV)	3.3	
Fall 1997:	19	4.3	3.62
Spring 1998	21	4.6	
Summer 1998:	21	4.9	4.70
Fall 1998:	21	4.6	
Spring 1999:	44(TV)	4.5	
Summer 1999:	22	4.5	4.60
Fall 1999:	22	4.9	
Spring 2000:	20	4.5	
Summer 2000:	20	4.9	4.71

Figure # 8



community in classes taught via distance. Interestingly, the classes with the lowest means were those taught on television. One can only speculate as to the meaning of these data; however, learning communities eventually emerged in all of the classes including the two taught on television.

Table 9 displays the summary judgment of the students as to the overall helpfulness of the Class Page. Following the initial year (1997) a consistent pattern of increased appreciation has been maintained.

Class participants have offered many comments that serve to substantiate the value attributed to the Class Page. One of the indicators of success has been the number of class members who have requested training in how to develop a similar Class Page for the students and parents with whom they work. During the Summer 2000 class, 19 out of 22 students voluntarily attended an additional workshop, on a late Friday afternoon no less, to learn about the process and application of creating a Web Page. Two of the remaining three students already had their own Web sites.

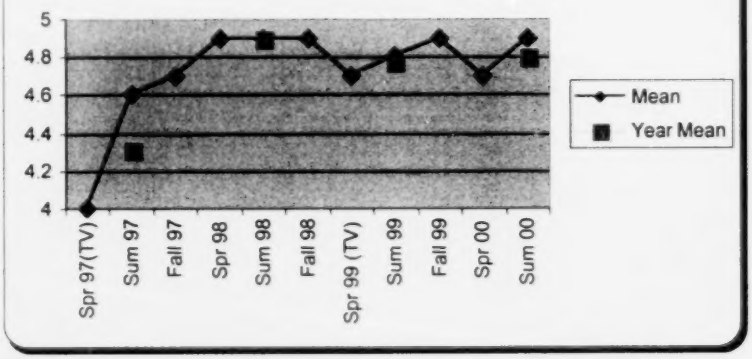
Based upon positive comments from students regarding their experiences with the Class Page, the researchers started asking in 1999 if the students thought such technologies should be utilized in other classes. Table 10 provides an illustration of their responses. The overwhelming feeling was that such technology was indeed helpful and valuable to the learning process.

TABLE # 9

Question: "The Class Page was helpful"

	N	Mean	Year Mean
Spring 1997:	41(TV)	4.0	
Summer 1997:	18	4.6	4.31
Fall 1997:	19	4.7	
Spring 1998	21	4.9	
Summer 1998:	21	4.9	4.90
Fall 1998:	21	4.9	
Spring 1999:	46(TV)	4.7	
Summer 1999:	22	4.8	4.77
Fall 1999:	22	4.9	
Spring 2000:	21	4.7	
Summer 2000:	22	4.9	4.80

Figure # 9



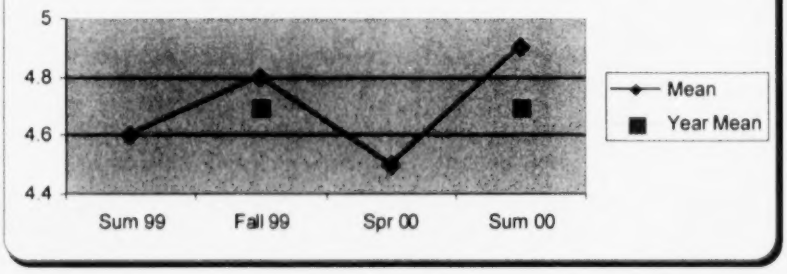
Respondents suggested that instructors in other classes could enhance learning by using such technology.

TABLE # 10

Question: "As I reflect upon my Class Page experiences, I think such opportunities should be available in most classes "

	N	Mean	Year Mean
Summer 1999:	22	4.6	
Fall 1999:	22	4.8	4.70
Spring 2000:	20	4.5	
Summer 2000:	20	4.9	4.70

Figure # 10



Summary

Instructional technology can be a valuable tool to increase learning. Usually, there is an initial fear of using technology on the part of the teacher; developing a comfort level in using instructional technology is essential. Instructor competence and comfort must be communicated to the student if the proper level of trust is to be developed. When students sense the instructor's belief that the technology will enhance their learning, students are more willing

and eager to try. A student who has success in using technology to enhance his/her own learning, experiences a euphoric feeling and power that such encounters provide. These experiences tend to multiply the chances of such a learner applying the same strategies in his/her own teaching. The potential for providing successive learning experiences may actually be unlimited.

Technology is a tool. It holds great mystique for some people. Applied to teaching, however, it appeals to a generation that considers it one hundred percent normal. Young learners in today's schools are not intimidated by the apparent magic of technology, but when they are asked to attack learning tasks in outmoded approaches they sometimes become bored. They may very well express their dissatisfaction through misbehavior and/or lack of respect for the teacher. If the teacher is technologically inept, students will discover it quickly. If the university professor is inept technologically, those preparing to teach under his/her tutelage are possibly shortchanged as beginning teachers today are expected to understand and use technology effectively in the teaching and learning process.

Student perception about the use of technology for improving learning becomes their reality. Positive classroom experiences in applying the use of a Web page to learning, increase the likelihood that similar experiences will be planned and taught in teachers' classrooms.

Lastly, the aggregation and disaggregation of data concerning the learning that is taking place in the classroom involves the teacher in a critical teaching

and learning exercise. When the teacher becomes involved in researching whether students are learning what the course was designed for, there is great potential for added understanding. It constitutes reflection at the highest level.

Recommendations

A support system for encouraging teachers to pursue the use of Web based technologies is necessary if such technologies are to be applied in the classroom. Part of such a support system would include incentives within the reward system, training opportunities for continuous development, and recognition for those who participate. Hardware and software procurement and maintenance are essential.

The collection of data from sources other than students might provide additional useful insights. Perhaps observers might visit a Web based class and record both teacher and student behaviors. An analysis of such behaviors might yield the need for different instructional approaches as well as different observational techniques. An example of observed behaviors might simply be to analyze how time is spent during class. Are the students on task? What is the level of student engagement? What are the cues the teacher uses for attention control? Obviously, this again requires teacher and student reflection. Metacognition is an aspect of teaching that holds great potential for the professional growth of teachers. Getting students to reflect on their unique approaches to learning could be a valid instructional approach in itself. When

supplemented by multiple sources of data, this could prove to be an extremely powerful tool in teaching and learning.

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